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ABSTRACT

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Discussion Paper No. 53

Williams Project on the Economics of Higher Education
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SO YOU WANT TO EARN A PH.D. IN ECONOMICS: HOW LONG DO YOU THINK IT WILL TAKE?

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March, 2000
DP-53

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ABSTRACT

The elapsed time taken to earn a Ph.D. in economics is analyzed with data from 620 (of about 950) 1996-97 Ph.D.s. The median is 5.3 years. A duration model indicates that those students at several of the most highly regarded programs, those supported by no-work fellowships, and those holding a prior masters degree finish faster than others. Americans, those who start jobs before completing their degree, and those who have children take longer. Kids slow the progress of women, but not of men. The only difference among fields is a longer time required for industrial organization and international economics. There is no difference in time-to-degree between men and women, married and single students, older and younger students, and those enrolled in larger or smaller Ph.D. programs. Fellowship support is more important for speeding the progress of women than that of men.

Brochures describing economics Ph.D. programs commonly tell prospective students that they should be able to complete the work required for a degree in four calendar years--usually two full years of course work, a third year to complete course work and prepare a thesis proposal, and a final year to complete their thesis and seek employment.[1] To encourage students to complete the requirements in that time frame, many programs limit financial aid to four years.[2]

In practice, however, less than twenty percent of those who eventually earn a Ph.D. in economics do so within four calendar years of entering the program; the median elapsed time between starting an economics Ph.D. program and earning a degree is now about 5.3 years. Because some people take extraordinarily long, the mean is about six years. With normal attrition rates factored in,[3] the overall proportion of entering Ph.D. students who might reasonably expect to have a degree in hand four years later falls to about ten percent. How long it takes to earn a degree should be of considerable interest to prospective students because, as study time expands, near-term costs of the degree rise and future expected benefits fall. An additional year of elapsed time spent in a Ph.D. program has an opportunity cost exceeding $50,000 for most students today.[4] Slower progress toward a degree also has an indirect financial cost for men. Holding other factors constant, new male Ph.D.'s who take more than five years to earn their degree incur a seven percent penalty in starting salary (Stock and Siegfried, 2000). Furthermore, additional elapsed Ph.D. study time reduces the length of an individual's independent scholarly or professional career.[5] Institutions should also be concerned about elapsed study time because they bear a considerable proportion of the costs,[6] accrue some of the

benefits from a Ph.D. program, and thus have an interest in the structure of the incentives facing the individuals who might attempt the degree.

Our goal in this paper is to convey, to both prospective Ph.D. students and those faculty responsible for Ph.D. programs, information about the actual elapsed-time-to-degree for 620 individuals who earned a Ph.D. in economics during the 1996-97 academic year. This sample[7] constitutes almost two-thirds of all those who earned a Ph.D. in economics in 1996-97.[8] We also analyze how differences in elapsed-time-to-degree among a subset of 456 of the graduates (for whom sufficient data are available) vary with their personal characteristics, financial circumstances, educational background, and choices they made among Ph.D. programs and fields of study.[9]

Elapsed-Time-to-Degree

It is useful at the outset to distinguish categories of time that can elapse between an individual's receipt of a bachelor's and a Ph.D. degree. First is time prior to initial registration in a Ph.D. program. This period may be devoted to employment, to other study, for example toward a second bachelor's degree or a master's degree, or to leisure. Anecdotal evidence suggests that the length of this period has been rising recently. We do not consider it in our study.

Second is time from initial registration until receipt of the degree. This time may or may not be coterminous with period in residence, or with formal registration. It seldom matches precisely time on campus or the period when a student is formally registered; post-coursework registration requirements vary so much among institutions

that formal registration is not a reliable measure of either full time study or elapsed-time-to-degree.

Third is time not enrolled in graduate school that occurs after a student has entered a Ph.D. program but before earning a Ph.D. The most common reason for such episodes is that a student takes a job before completing a thesis, usually after attaining ABD (all but dissertation) status. This period frequently, but not always, ends with receipt of the Ph.D.

We asked our sample of students explicitly "when did you begin your Ph.D. program?" and "when was your Ph.D. granted?" We told them to ignore master's degrees earned routinely in the pursuit of a Ph.D. and to consider the date on their diploma rather than either the date of their thesis defense or the date of their graduation ceremony as the time when their Ph.D. was granted.

Our measure of elapsed-time-to-degree, therefore, is the length of the period that elapsed between entering the Ph.D. program and the date the degree was awarded, whether or not this time was spent in residence, formally enrolled, registered, or employed full or part-time. It addresses the question "if you do complete your degree, how long do you expect to take to earn it?" Our data, unfortunately, tell us nothing about completion rates. Everyone in our sample earned the Ph.D.

Because we organize the data by when the graduates earned their degrees rather than by when they entered their Ph.D. programs, we risk biasing the absolute level of median elapsed-time-to-degree (Bowen, Lord, and Sosa, 1990). During periods when the size of entering cohorts decreases, for example, both the absolute level of median time to

degree and any increase in time to degree will be overstated. The exaggeration of the median elapsed-time-to-degree and its increase is partly a statistical artifact, caused by "the inability of the successively smaller entering cohorts to replace fully the number of "fast" recipients from previous (larger) entering cohorts (Bowen, Lord, and Sosa, 1990, reproduced at p. 351 of Bowen and Rudenstine, 1992). Fortunately, neither the rate of change in elapsed-time-to-degree nor its absolute level are the focus of our investigation. Rather, we are interested in differences in elapsed-time-to-degree among individuals receiving their degrees in a particular year. Moreover, the number of Ph.D.'s awarded in economics has been relatively constant over the past twenty years, hovering between 800 and 900.[10] For these reasons we believe that grouping graduates by year of degree is reasonable.[11]

The median, mean, and standard deviation of elapsed-time-to-degree for 620 Ph.D.s earned in 1996-97 are reported in table 1 by ranking of graduate program ("tiers"), by field of specialization for those fields with 10 or more observations in our sample, by prior graduate education, and by sex. The overall median is 5.3 years. Students at first tier institutions get done about six months faster than those enrolled at other universities. Economists specializing in labor, development, and urban, rural and regional economics take longer than specialists in agricultural and natural resources, macro and monetary, financial, or international economics. Women take slightly longer than men to earn their Ph.D.

The median elapsed-time-to-degree for those universities with at least seven graduates in the sample is reported in table 2. The range is substantial. Among the larger

Ph.D. programs in economics, the median ranges from approximately 3.8 years at M.I.T. and Harvard up to about seven years for Michigan and Maryland.

Determinants of Elapsed-Time-to-Degree

Our elapsed-time-to-degree data are from a survey of new Ph.D. economists in 1996-97 who were also asked about their field of study, their personal background, and the type of financial aid they received while studying for the Ph.D. Consequently, we are able to explore cross-section relationships among these detailed characteristics and the elapsed time it took each individual to earn the Ph.D.

There has been scant prior study of the time Ph.D. economists take to complete their degrees. Most of what has been done uses the National Science Foundation's Survey of Earned Doctorates (SED) records or the National Research Council's Doctorate Records File (DRF), neither of which includes much information that might be expected to affect elapsed-time-to-degree. Breneman (1976) offers some peripheral observations about the duration of Ph.D. study in his analysis of the doctoral production process, but he focuses primarily on the determinants of attrition.

The first systematic study of elapsed-time-to-degree appeared in 1965 (Wilson). Wilson's study for the Southern Regional Education Board included a sample of 57 (all male) economics Ph.D.s who entered Florida, Kentucky, Virginia, North Carolina State, Louisiana State, and Vanderbilt in the 1950s. He found that economists who took longer to earn their degree were less likely to have majored in economics as undergraduates, more likely to have been employed prior to earning their degree, less likely to have received work-free fellowship support, and more likely to have had children.

Abedi and Benkin (1987) used DRF data to study 4,255 UCLA graduates who received their doctorates between 1976 and 1985. Economists were apparently included in the data, but were not studied separately. They found that it took doctoral students with no institutional financial aid, women, and those with children longer to earn their degree. Age, citizenship, and ethnicity were unrelated to elapsed-time-to-degree.

Tuckman et al. (1990) undertook a comprehensive empirical study of elapsed-time-to-degree for eleven Ph.D. disciplines, including economics. Using SED data, they found that economists took less time to complete their degrees during periods when starting salaries were rising faster (perhaps validating the students' understanding of economic principles). They also observed that students who earned their bachelor's degree at an elite college or university completed their Ph.D. faster, those with a foreign bachelor's degree and/or holding a foreign visa took longer, those who entered their Ph.D. program at an older age took longer, and those with either federal financial support, private foundation support, or research assistantships finished faster.

More recently, Bowen and Rudenstine (1992) examined elapsed-time-to-degree for six disciplines at ten elite research universities using DRF data. Based primarily on cross-tabulations, they concluded that students in larger Ph.D. programs take longer to finish and that financial aid received in the form of teaching assistantships with work duties slows progress toward the degree.

Finally, Ehrenberg and Mavros (1995) estimated a duration model of elapsed-time-to-degree for Ph.D. students for four disciplines, including economics, using 24 years of data from Cornell University. For economics they discovered faster completion

times for students with higher verbal (but not quantitative) entrance examination scores, and for foreign students. Students with fellowship support requiring no work completed their degrees faster than those holding a teaching assistantship. There was no difference in elapsed-time-to-degree between men and women, or based on whether students held a masters degree when they entered their Ph.D. program.

We have sufficient data to explore most of the hypotheses implied by these earlier studies. In addition, we test whether married students complete their degrees faster than single students, whether there are systematic differences in elapsed-time-to-degree based on the reputational rank of programs, and whether elapsed -time-to-degree varies predictably by specialized field of study.

The predicted signs and empirical results, using a duration model based on a Weibull distribution,[12] are reported in table 3. A duration model is more appropriate for estimating a change in situation (from not completed to completed) that occurs at different times for different individuals (i.e. estimates of elapsed duration of graduate study) than the regression analyses used in most prior studies. The sign of the expected time coefficients reported in table 3 indicate whether an increase in the explanatory variable will lengthen (positive sign) or shorten (negative sign) the expected elapsed-time-to-degree. For those estimated coefficients that are significantly different from zero at the 0.10 level using the appropriate tailed test for the hypothesis we report "marginal effects" in the final column of table 3. These marginal effects indicate the expected change in elapsed-time-to-degree (in months) if the explanatory variable increases by one unit (or changes from 0 to 1 for binary variables), ceteris paribus.

F-tests revealed that a set of binary variables distinguishing the races of the graduates does not help predict when students complete their degrees. Because none of the individual binary variables for race is statistically significant, and because their omission has virtually no effect on the other results, we omit them from the reported estimates.

We experimented with a set of binary variables that identify individual Ph.D. programs because we expect that many of the structural attributes of the programs as well as the identity of thesis advisors may affect the speed of completion. We initially included individual variables denoting each of the 24 programs that had seven or more graduates in the regression sample.[13] An alternative specification to capture differences among Ph.D. programs is to include the "tier" in which they are ranked by the NRC in terms of the quality of their Ph.D. program (Goldberger, et al., 1995). When we use a set of binary variables reflecting tiers for each program (tier 5, ranks greater than 48, is the omitted benchmark) instead of the set of variables distinguishing individual Ph.D. programs, there is virtually no difference in the estimated coefficients for other variables. For simplicity we report the results including the tiers signifying NRC ranks. None of the binary variables distinguishing the quality tiers of the programs is significant. This finding is inconsistent with Bowen and Rudenstine (1992, Chaps. 4 and 7), who observed that students at the most highly regarded institutions earned their degrees in less time.

When the binary variables for individual institutions are included instead of the tier indicators, among the top 48 programs only M.I.T. and Minnesota obtain an estimated coefficient that is statistically significantly different (at the 0.10 level) from the

group of omitted institutions. The estimated coefficients indicate a remarkable time saving of two full years at M.I.T., and thirteen months at Minnesota, relative to the average time required at all institutions other than the 24 included ones.

Each graduate identified his or her field of specialization. There were a sufficient number of observations to distinguish eleven subfields with binary variables: micro theory, mathematical economics and econometrics, macro and monetary economics, international, financial economics, public finance, health economics, labor economics, industrial organization, development, and agricultural and natural resource economics. A twelfth category includes all other subfields. Micro theory is used as the benchmark. The estimates distinguish two fields as taking significantly longer than micro theory--international economics and industrial organization. Both estimated coefficients are statistically significant at the 0.01 level. They indicate an additional elapsed-time-to-degree of 10 months for international and 11 months for industrial organization. None of the other subfields takes significantly longer than micro theory, other things held constant. The only field with an estimated hazard ratio suggesting less elapsed-time-to-degree than micro theory is agricultural and natural resource economics, but the difference is trivial and not significant.

Three variables are used to distinguish the type of financial aid the graduates received while in graduate school: pure fellowship aid, pure assistantship aid, and a combination of fellowship and assistantship aid. Nine percent of the graduates enjoyed work-free fellowship support, 44 percent received some fellowship and some (research or teaching) work-related assistantship support, and 41 percent received exclusively work-

related assistantship support. Because the financial aid information comes directly from the graduates, it should include external as well as institutional support. We expect work-free fellowship support to reduce elapsed-time-to-degree by freeing students from alternative time consuming work.

The results are consistent with this hypothesis, indicating that those fortunate 39 students in our sample who had pure fellowship support completed their degrees a calendar year faster than those holding only assistantships that required work. The estimated coefficient is significant at the 0.05 level. Unfortunately, causation is ambiguous, as it is likely that students are selected for fellowship support on the basis of their prospects for earning a Ph.D., and doing so without delay. Thus either fellowships relieve students of sufficient work responsibility to speed their progress toward a degree or graduate economics financial aid committees award fellowships to students who complete degrees faster, or both. As expected, those with a combination of fellowship and assistantship support progress slower than those with pure fellowship support, but still (four months) faster than those whose financial support is exclusively assistantships.[14]

Our result that pure fellowship support speeds progress toward the Ph.D., based on sample data from a wide cross-section of universities, is consistent with Ehrenberg and Mavros' (1995) findings using Cornell University data from four fields: economics, English, physics, and mathematics. Ehrenberg and Mavros, however, were able to control somewhat for student ability by using entrance examination scores. Surprisingly, the only connection between either verbal or quantitative entrance exam scores they

uncovered across the four fields was a faster completion rate for economics students with higher verbal scores. While holding constant economics students' verbal and quantitative entrance exam scores Ehrenberg and Mavros, like us, found that pure fellowship support speeds degree progress relative to pure teaching assistantship financial aid (pp. 598-99).

Bowen and Rudenstine (1992) concluded that "time to degree is... related to the scale of the graduate program. In [their] six fields [including economics], recipients of doctorates in the larger programs took almost one full year longer to complete their work than their counterparts in the smaller programs." (pp. 155-560). Bowen and Rudenstine speculated that this correlation might reflect lower faculty to student ratios in larger programs, which tend to handicap student advising and the monitoring of Ph.D. student progress. In addition, larger programs may reduce personal interactions between faculty and graduate students (p. 229). Alternatively, larger programs may slow students' progress by causing more false starts as a result of the wider array of courses, subfields, and options available. Finally, there is the possibility that larger programs are more diverse intellectually, with the resulting competition for ideas making it more difficult for students to choose an intellectual path (Bowen and Rudenstine, p. 229).

The consistent difference Bowen and Rudenstine found between larger and smaller programs was smallest for economics. To evaluate the effect of program size on elapsed-time-to-degree we included a measure of the total number of graduate students enrolled in each economist's Ph.D. program (taken from the NRC ratings) (Goldberger et al., 1995). The average program size is 105 students, with a standard deviation of 53. In

contrast to Bowen and Rudenstine, our results indicate that economics students in larger programs do not take longer to complete their degree requirements.

The usual expectation is that students who switch fields between their undergraduate and graduate education lose time while "catching up" to their graduate student colleagues who stayed in the same field. Because graduate education in economics is so different from undergraduate economics education, however, this hypothesis may not apply to economics. Indeed, our empirical results indicate that those who studied economics for their degree immediately prior to entering a Ph.D. program take longer to earn a Ph.D., although the estimated coefficient is (just barely) insignificant at the 0.10 level.

Among the 456 economists in the sample, 190 had a masters degree when they entered their Ph.D. program. One hundred twenty-nine of those masters degrees were earned in some type of economics program; another 33 were in fields that could be expected to help a Ph.D. student in economics, e.g. mathematics, statistics, business administration, finance, or engineering. Even those who earned a masters degree in philosophy, literature, developmental biology, or political science may have acquired research and study skills that would help them earn an economics Ph.D. faster. Ehrenberg and Mavros (1995, p. 598) found that individuals who had a masters degree prior to entering their doctoral program at Cornell were more likely to earn their degree faster. Thus, we expected those with a prior masters degree to earn their Ph.D. faster, and that is what we discovered; the estimated coefficient is significant at the 0.01 level, and suggests a saving of seven months.

Those who take a job prior to completing their Ph.D. face lower opportunity costs of delay in earning the Ph.D., and have job responsibilities that may slow their degree progress. The results indicate that a year of employment prior to earning the Ph.D. adds about 0.6 months to elapsed-time-to-degree; the estimated coefficient is significant at the 0.01 level.

The average age at entry to a Ph.D. program is 27.2 years. The standard deviation of 4.7 years, however, indicates quite a number of individuals beginning study toward a Ph.D. at all ages ranging from 22 to 32. Younger students, fresh from their undergraduate education, may be more enthusiastic and require less time to rehabilitate skills they have forgotten. Older students, on the other hand, may have a greater appreciation for the opportunity cost of Ph.D. study and thus be more focused on getting through the program. In addition, because older students who enroll in Ph.D. programs face shorter expected careers than younger students, older students who choose to matriculate are more likely to be ones who are motivated to finish quickly. The empirical estimates reveal no discernible net effect of age at entry on time to completion, however.

Because we control separately for having children, which may affect female students differently than male students, our prediction for the sign of the binary variable that indicates sex was ambiguous. There is no evidence from our sample of any statistically significant difference in elapsed-time-to-degree between women and men, a finding consistent with Ehrenberg and Mavros (1995, p. 598).

Other things equal, married students may complete their degree requirements faster because of financial support from their spouse. On the other hand, married

students may devote time that single students do not to maintain a relationship with their spouse. The empirical results indicate that marital status is not related to elapsed-time-to-degree. Children, however, are a different matter. As would be expected, children slow degree progress substantially, by about six months on average. A difference emerges when the model is estimated separately for the 338 men and the 117 women, however. The presence of children slows progress toward the degree for women by about eleven months (significant at the 0.01 level), while the effect on men is only about three months, and not statistically different from zero.[15]

The sample used for estimation is comprised of 54 percent U.S. citizens and 46 percent foreign students. Foreign students often pay a higher opportunity cost for graduate education in the U.S. because they are separated from family and friends. They also tend to be well trained in mathematics. There is also evidence that U.S. Ph.D. programs in economics discriminate against foreign applicants (or in favor of domestic applicants) (Attiyeh and Attiyeh, 1997), in which case foreign students should be better prepared for graduate study than their domestic counterparts. Each of these factors might induce foreign students to finish faster than Americans. On the other hand, a substantial proportion of foreign students in economics lose time while grappling with a second (or third) language, and some from quite poor countries may be in no hurry to complete their degrees because their standard of living as a graduate student in the U.S. compares favorably with the standard of living of a professional economist in their home country. Thus the predicted sign on our binary variable identifying U.S. citizens is ambiguous. The results indicate that foreign students complete their degrees about six months faster

than American students. Ehrenberg and Mavros (1995, p. 598) found qualitatively similar results for Cornell's Ph.D. program in economics.

Outliers

Those people who take a particularly long time to complete their degree and those who zip through a program quickly are frequently atypical. In our duration model sample are three individuals who completed their degree requirements in fewer than three years, and three who took longer than 16 years.[1] To test the sensitivity of our results to such "outliers," we excluded the (arbitrarily chosen) two percent of extreme observations in each tail of the elapsed-time-to-degree distribution. This procedure dropped the nine fastest finishers and the ten slowest finishers from the sample. After excluding them, the range of elapsed-time-to-degree dropped from 16.6 (2.67 to 19.25) to 8.6 (3.42 to 12.0) years.

A number of changes occur when the extreme observations are omitted. First, the effect of holding a prior masters degree on speeding progress to a degree disappears. This happens because eight of the nine fastest finishers had a masters degree when entering their Ph.D. program. Second, women now take five months longer than men, those at larger Ph.D. programs progress a tiny bit slower,[1] as Bowen and Rudenstine (1992) found, and those at top tier programs finish seven months faster than those at tier five institutions. Third, there is no longer any difference in elapsed-time-to-degree based on field of specialization. The long time required to complete a degree in international economics and industrial organization is based on a few very slow finishers who specialized in those fields. The two slowest finishers in the sample were in international;

three of the next eight slowest finishers specialized in industrial organization. Finally, the pure fellowship indicator is no longer significant when the outliers are omitted because a disproportionate number of those who finished very quickly had the benefit of full fellowship support.

Conclusion

It took those people who earned a Ph.D. in economics during 1996-97 on average 5.3 years from when they entered their doctoral program until they received their degree. The amount of time it takes to earn a Ph.D. in economics varies substantially across universities, but when other things are controlled, the only inter-university differences that appear meaningful among top tier programs are the substantially shorter elapsed times at M.I.T. and Minnesota. Discussions with M.I.T. faculty suggest that the remarkably shorter elapsed-time-to-degree there might reflect a culture of getting done promptly that is passed down among M.I.T. graduate students and is reinforced by a second year empirical essay requirement that frequently leads to a thesis.

Our analysis indicates that those who hold a masters degree take seven months less to earn a Ph.D. in economics. Of course the usual time required to obtain the masters degree more than offsets this saving. Parenthood slows time to degree for women by approximately a year, but is not related to the time men take to earn a Ph.D. Foreign graduate students complete their degree requirements faster than Americans. Work-free fellowships speed progress relative to teaching or research assistantships. As expected, accepting employment without the degree in hand slows progress.

We found no evidence that size of the Ph.D. program, age, marital status, sex, or race is associated with the amount of time it takes to earn a degree. Those specializing in international economics or industrial organization seem to take substantially longer than others. Switching into economics from another field does not slow progress toward the degree. To the contrary, if anything, the results indicate that those who major in economics in their immediately prior degree take longer to finish than do those who switched disciplines.

The main weakness of our study is the lack of information on student ability. Using a model of faculty prestige maximization, Breneman (1976, p.15) identified student ability as a critical determinant of time-to-degree for doctoral students. Higher ability students are poised to enhance the prestige of their thesis advisors; lower ability students are not. According to Breneman's reasoning, lower ability students, therefore, will take longer to secure a willing thesis advisor, and consequently will earn their degree more slowly than higher ability students.[18]

Our results are consistent with the finding of Ehrenberg and Mavros (1995) that pure fellowship support reduces the elapsed-time-to-degree for Ph.D. students in economics. Fortunately, Ehrenberg and Mavros were able to control for student ability, although they were limited to data from one university. Our analysis adds consistent (albeit absent controls for student ability) evidence about the importance of fellowship support based on a sample of individuals who successfully earned a Ph.D. in economics at many institutions.

TABLE 1. Elapsed-Time-to-Degree for 1996-97 Ph.D.s in Economics

Classification	Median Years	Mean Years	Standard Deviation	Sample Size
Entire sample	5.3	5.9	2.1	620
Tier 1 (rank 1-6)	4.8	5.3	1.7	98
Tier 2 (rank 7-15)	5.5	6.1	2.0	110
Tier 3 (rank 16-30)	5.4	6.1	2.4	104
Tier 4 (rank 31-48)	5.7	6.0	2.0	86
Tier 5 (rank > 48)	5.3	5.7	2.1	188[1]
Agriculture & Nat. Resources	5.0	5.3	1.2	54
Macro & Monetary	5.0	5.5	2.0	76
Financial Economics	5.0	5.8	2.0	45
International	5.1	5.9	2.8	81
Quantitative (math & metrics)	5.3	5.4	1.6	43
Public Finance	5.3	5.8	2.2	56
Health, Education, Welfare	5.3	6.0	1.6	29
Micro Theory	5.4	5.8	1.2	27
Industrial Organization	5.4	6.2	2.5	62
Labor	5.7	6.1	2.0	58
Development	5.7	6.0	1.7	50[2]
Urban, Rural & Regional	5.8	6.1	1.9	15
Without Prior Masters Degree	5.3	6.0	2.1	398
With Prior Masters Degree	5.3	5.6	2.0	122
Men	5.3	5.8	2.1	467
Women	5.7	6.1	2.1	152

Source: Authors' survey of 1996-97 Ph.D.s in Economics.

[1] 34 respondents graduated from institutions that are not ranked - mostly Canadian and non-economics departments.

[2] 24 respondents specialized in fields that are not listed.

TABLE 2. Elapsed-Time-to-Degree for 1996-97 Ph.D.s in Economics, by Institution.

Institution	Median Years	Sample Size
M.I.T.	3.8	20
Southern Illinois	3.8	7
Missouri	4.3	10
Hawaii	4.3	9
Purdue	4.7	10
Duke	4.8	9
Harvard	4.8	28
Minnesota	4.9	9
Washington (St. Louis)	5.0	8
Chicago	5.1	16
Kansas State	5.1	9
Ohio State	5.2	12
Princeton	5.2	14
Penn State	5.3	13
California-Berkeley	5.3	25
Illinois	5.3	19
Iowa State	5.3	7
UCLA	5.3	7
Wisconsin	5.3	25
Yale	5.3	10
Cornell	5.3	16
Colorado	5.4	8
Claremont	5.4	9
Georgetown	5.5	12
American	5.7	12
Columbia	5.7	17
California-San Diego	5.8	8
Pittsburgh	6.0	13
Pennsylvania	6.1	11
Toronto	6.3	7
Texas	6.5	11
Stanford	6.6	9
Virginia	6.7	8
Michigan	6.8	14
Maryland	7.3	12

Source: Authors' survey of 1996-97 Ph.D.s in Economics.

Institutions are listed if at least seven of their 1996-97 Ph.D.s are in the sample.

TABLE 3. Determinants of Elapsed-Years-to-Degree: Duration Model.

Explanatory Variable	Predicted Sign	Mean	Estimated Expected Time Coefficients[1]	z-ratio	Predicted Change in Time-to-Degree for Statistically Significant Attributes (in months)
Constant	----	-----	1.622	10.99**	
Tier 1 (rank 1-6 = 1)	?	0.19	-0.104	-1.43	
Tier 2 (rank 7-15 = 1)	?	0.22	-0.024	-0.36	
Tier 3 (rank 16-30 = 1)	?	0.16	- 0.026	-0.44	
Tier 4 (rank 31-48 = 1)	?	0.15	0.026	0.48	
Fellowship support (only)	-	0.09	-0.181	-2.78**	-11.6
Fellowship and assistantship	-	0.44	-0.061	-1.61*	- 4.1
No financial aid	?	0.06	-0.042	-0.54	
Size of program (students)	?	105	0.001	1.05	
Prior degree econ (yes = 1)	?	0.72	0.063	1.54	
Prior masters degree (yes = 1)	-	0.42	-0.110	-2.90**	-7.1
Years employed prior to Ph.D.	+	0.73	0.017	2.71**	0.6[2]
Age entering Ph.D. program	?	27.2	0.004	0.38	
Sex (female = 1)	?	0.26	-0.005	0.11	
Marital Status (married = 1)	?	0.63	-0.020	-0.47	
Children (yes = 1)	+	0.36	0.094	2.09**	6.4
Citizenship (US = 1)	?	0.54	0.094	2.65**	6.2
Field of study (11 binary variables included; results reported in text)					

Mean elapsed-years-to-degree = 5.9
Chi-square = 86.46**
n = 456
* = significant at 0.10 level
** = significant at 0.05 level
Two-tail test used if predicted sign is ambiguous; one-tail otherwise

[1] Also known as "accelerated failure-time coefficients."

[2] Calculated for those employed one year prior to earning their degree; the marginal effect is non-linear, but averages about two months per year of prior employment over the first five years of pre-degree employment.

NOTES

1. See, for example, descriptions of Ph.D. programs on Internet home pages for Brandeis, Florida State, Illinois, M.I.T., New York University, and Washington University (St. Louis) in June 1999.

2. See, for example, Internet home page descriptions of financial aid support for Ph.D. study at Brown, Harvard, Michigan, Minnesota, New Mexico, and Rutgers in June 1999.

3. Bowen and Rudenstine (1992, p. 124) report a completion rate of 55 percent for economics.

4. Siegfried and Stock (1999, p.123) report a median starting salary of $54,000 for 307 1996-97 economics Ph.D.s with full-time jobs in the United States.

5. It is possible, of course, that sufficient skills are added during this period to fully compensate for the delay.

6. In addition to the direct costs of subsidized tuition and financial aid, universities provide a large subsidy to all graduate students in the form of pricing below cost (Winston and Yen,1995). Of course the value of services performed by graduate students on assistantships offsets some of these subsidies.

7. See Siegfried and Stock (1999, p.119) for details about the sample and how it was obtained.

8. Siegfried and Stock (1999, p.118) estimate about 950 Ph.D.s in economics were earned from U.S. universities in 1996-97.

9. The principal cause of the sample shrinking from 620 to 456 is that data on elapsed-time-to-degree for 113 observations come from thesis advisors of the graduates rather than from the graduates themselves. We are missing data on some personal characteristics for all of these people. The remainder of the sample attrition is due to missing information about Ph.D. program rank for all Canadian and a few U.S. institutions.

10. The average annual number of Ph.D.s awarded for 1971-1976 was 801; for 1991-1996 it was 888 (Digest of Educational Statistics, 1998; table 298). The average annual increase in number of degrees awarded over the 20 year period is one-half of one percent.

11. Using a sample of individuals who all received their degrees in a particular year also allows us to evaluate a complete set of those who eventually earn their degree without having to initiate our study in the 1960s.

12. The results are virtually the same when the duration model is based on an exponential distribution.

13. The 24 included Ph.D. programs are: American, California-Berkeley, Chicago, Claremont, Columbia, Cornell, Georgetown, Harvard, Illinois, Iowa State, Maryland, M.I.T., Michigan, Minnesota, Ohio State, Penn State, Pennsylvania, Pittsburgh, Princeton, Southern Illinois, Texas, Virginia, Wisconsin, and Yale.

14. Hansen and Craig (1975) found no statistically significant difference in elapsed time-to-degree between those who received only work-related assistantship aid and those who received a combination of fellowship and assistantship support at the University of Wisconsin in the late 1960's.

15. There are several other differences in the structural relationship between men and women. Having a prior masters degree hastens degree progress for men, but does not help women. Starting a job before earning the degree slows progress toward the degree for women, while having no effect on men. Finally, pure fellowship support speeds the progress of women substantially vis-a-vis assistantship support, while the form of financial aid does not effect progress toward the degree within the sample of men.

16. Of the 456 Ph.D. economists in the duration model sample, 19 (four percent) completed their degree by the end of their fourth academic year (i.e. in 3.75 or fewer years); 38 more appear to have completed their degree by the end of the summer following their fourth academic year, implying that twelve percent of this group had a degree in-hand in four or fewer years. At the other extreme, 22 individuals (five percent) took 10 or more years from matriculation to degree in-hand; 51 (eleven percent) earned their Ph.D. more than 8 years after matriculation.

17. While statistically significant, the marginal effect of program size is trivial. Within a reasonable range of Ph.D. program size, an increase of ten students (about a ten percent increase) is predicted to slow the progress of the average student by only about two weeks.

18. Breneman concludes (1976, p.14) that prestige maximizing faculty receive utility from more prestigious job placements for their Ph.D. students, and thus students who appear headed for more prestigious jobs find a thesis advisor faster and complete their degree sooner than others. If we assume that full-time permanent academic jobs in the U.S. are more prestigious than other jobs for economists and that individuals actually land jobs in the sector that advisors might predict a few years earlier, we would expect those with such academic appointments to experience less elapsed-time-to-degree. As it turns out, when full-time permanent academic job in the U.S is added to the hazard model reported in table 3, the coefficient is negative, as Breneman predicted, and significant at the 0.10 level. The estimated coefficient implies that those graduates who land full-time permanent academic jobs in the U.S. take four months less than others to earn the Ph.D., ceteris paribus.

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